REPLY: Patent Foramen Ovale and Paradoxical Systemic Embolism: Can We Determine High-Risk Characteristics by Echocardiography?

We appreciate the comments by Dr. Ren and colleagues on our review of paradoxical embolism and related diagnosis and treatment (1) and their insights on their experience with intracardiac echocardiography (ICE). Although ICE provides detailed anatomic information of intracardiac structures, including the atrial septum, it is mainly used as an intraprocedural guide and imaging tool in complex cardiac interventions. Conversely, it does not qualify as a diagnostic screening examination in patients with cryptogenic embolism for the detection of interatrial shunts. First, ICE is an invasive imaging modality that requires the insertion of an 8-F catheter probe into the venous circulation, which can be associated with periprocedural complications such as bleeding, hematoma, and thrombosis. Second, studies comparing ICE with transesophageal echocardiography or transcranial Doppler studies have failed to show improved accuracy and effectiveness in the detection of interatrial shunts (2). Third, the use of ICE is associated with significant costs related to the expensive, disposable imaging catheters.

Although there are no standardized recommendations to fully describe the anatomic and physiological characteristics of the patent foramen ovale (PFO), several echocardiographic high-risk criteria for the recurrence of paradoxical embolism have been identified. As recently confirmed by the RoPE (Risk of Paradoxical Embolism) investigators, a significant atrial septal aneurysm with an interatrial septal excursion during a cardiac cycle of ≥10 mm represents a strong risk factor for recurrent stroke in the presence of a PFO (3). In addition, larger anatomic and physiological size of the PFO has been associated with an increased risk of recurrent stroke (4). Along this line, it has been suggested that the mechanism by which atrial septal aneurysms increase the risk of stroke in the presence of a PFO is directly related to a larger PFO size. Considering the intrauterine function of the Eustachian valve, which directs oxygenated venous blood from the inferior vena cava preferentially to the PFO, it is plausible that particularly in patients with residual, prominent remnants of the Eustachian valve, the latter presents a risk factor for recurrence of stroke. Finally, we wish to point to the growing body of evidence highlighting important differences in performance and effectiveness of available PFO closure devices to prevent recurrent embolic events that should be taken into consideration when evaluating the benefit of percutaneous PFO closure (5).

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